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(to be used for all correspondence after initial filing)

Application Number	10/735,370
Filing Date	December 12, 2003
First Named Inventor	ACKERMAN et al.
Art Unit	1762
Examiner Name	K. BAREFORD
Attorney Docket Number	130013/11921 (21635-0116)
Total Number of Pages in This Submission	

ENCLOSURES *(check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
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- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
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- ☒ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
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Return Receipt Postcard; Certificate of Mailing; Applicant's Reply Brief (39 pages)

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm	McNees Wallace & Nurick LLC		
Signature	[signature] #50,311		
Printed Name	Shawn K. Leppo		
Date	March 1, 2006	Reg. No.	50,311

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Attorney Docket No. 130013/11921 (21635-0116)
Serial No. 10/735,370

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: John Frederick Ackerman et al.	)	GAU: 1762
Application No. 10/735,370	)	Examiner: K. Bareford
Filed: December 12, 2003	)	

For: ARTICLE PROTECTED BY A THERMAL BARRIER COATING HAVING A CERIUM OXIDE-ENRICHED SURFACE PRODUCED BY PRECURSOR INFILTRATION

APPLICANT'S REPLY

MAILSTOP - APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant files this Reply under 37 CFR 41.41 and requests that the appeal be maintained pursuant to 37 C.F.R. 40.40(b)(2) in response to the new grounds of rejection raised in the Examiner's Answer.

Applicant incorporates its prior Appeal Brief, except as noted.

The Examiner's Answer adds four new grounds of rejection. Applicant has numbered these four new grounds as Ground 4-Ground 7 and addresses each of the seven grounds of rejection in order.

Accordingly, the grounds of rejection are now:

Ground 1. Claims 13-17 are rejected under 35 USC 102 over Subramanian U.S. Patent 6,296,945.

Ground 2. Claims 1-7, 9, and 11 are rejected under 35 USC 103 over Subramanian in view of Ueda U.S. Patent 5,697,992.

Ground 3. Claim 10 is rejected under 35 USC 103 over Subramanian in view of Ueda, and further in view of Taylor U.S. Patent 5,520516.

Ground 4. Claims 13-17 are rejected under 35 USC 102(b) as being anticipated by Subramanian U.S. Patent 6,296,945 in view of Stoffer U.S. Patent 5,932,083.

Ground 5. Claims 13-17 are rejected under 35 USC 103 as being unpatentable over Subramanian U.S. Patent 6,296,945 in view of Stoffer U.S. Patent 5,932,083.

Ground 6. Claims 1-7, 9 and 11 are rejected under 35 USC 103 as unpatentable over Subramanian in view of Stoffer and Ueda.

Ground 7. Claim 10 is rejected under 35 USC 103 as unpatentable over Subramanian in view of Stoffer and Ueda, and further in view of Taylor U.S. Patent 5,520,516.

In this Applicant's Reply, Applicant will not attempt to restate all of its positions from the Appeal Brief as to Grounds 1-3. Applicant will instead address the positions of the Examiner's Answer. Applicant will respond in full to the new Grounds 4-7. Applicant notes that each of the Responses to Argument beginning at page 19 of the Examiner's Answer includes a paraphrase of what is purported to be Applicant's Arguments. Applicant does not agree that these paraphrases are correct in all instances and requests that the Board consider Applicant's positions as those actually stated in the Appeal Brief and this Reply.

Prior to addressing the individual Grounds, however, Applicant addresses a fundamental flaw that has become apparent in all of the rejections and their explanations.

Each of the seven rejections is based on Subramanian U.S. Patent 6,296,945 as the sole or primary reference. The statement of the disclosure and teaching of Subramanian, as expressed in the explanations of the various rejections is fundamentally flawed.

The present claims all recite a highly specific material,

"cerium oxide with cerium in the +4 oxidation state."

Whether the prior art discloses or teaches this limitation is a key consideration for the Board in deciding whether to sustain the rejections.

The examiner's position argues that Subramanian discloses or teaches this limitation. Because Subramanian is the sole or primary reference in all of the rejections, the fundamental error must be highlighted so that it may be understood why none of the seven grounds of rejections set forth a prima face basis for rejection.

Subramanian discloses:

> "These and other objects of the invention are accomplished by providing a turbine component comprising a metal alloy substrate and a columnar thermal barrier coating on the substrate surface the coating having (1) a columnar-grained ceramic oxide structure material base, and (b) a heat resistant ceramic oxide sheath material covering the columns of the base, where the sheath comprises the reaction product of a ceramic oxide precursor sheath material which consists essentially of the composition C_zO_w and the ceramic oxide columnar structure material which consists essentially of the composition $(A,B)_xO_y$, where A and B are selected from stable oxides which will react with C_zO_w, and <u>C is selected from stable oxides that will react with $(A,B)_xO_y$</u>. A, B, and C can be, for example, at least one of Al_2O_3, CaO, Y_2O_3, Sc_2O_3, ZrO_2, MgO, and the like." [emphasis added] (Subramanian, col. 2, lines 25-40; see also claim 1)

Initially in the prosecution and in the very first rejection, the examiner took the position that "component C can be Ce" (Office Action of April 1, 2005, page 2 line 18). This position has been continued to the present. However, it is apparent that component C cannot possibly be Ce, and Subramanian's C_zO_w cannot possibly be Ce_zO_w, as argued at many locations in the Examiner's Answer (e.g., page 28, line 10). According to the disclosure of Subramanian, "C is selected from stable oxides that will react with $(A,B)_xO_y$", where x and y are indefinite. That is, C itself must be an oxide, and then that oxide C is further combined with oxygen in some unspecified manner and ratio to form a more-complex oxide of the form C_zO_w, where z and w are indefinite. Subramanian's C_zO_w material therefore has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$"

A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian.

In an attempt to be general, Subramanian is also vague. The only two places that cerium is mentioned, in the midst of laundry lists of other elements, are at col. 5, line 38-43 and claim 3. The text at col. 5 line 40 makes it clear that C is not unoxidized, elemental cerium: "C can be any A or B compound listed above..." That is, C is not an element, but a compound, specifically "a stable oxide that will react with $(A,B)_xO_y$."

Applicant's rejected claims contain a limitation of the form "cerium oxide with cerium in the +4 oxidation state." In the flawed interpretation of Subramanian with C misinterpreted as cerium, the argument advanced by the examiner has been that Subramanian's C_zO_w, with z and w indefinite, disclosed or taught CeO_2, with cerium in the +4 oxidation state. That interpretation was not correct and was not demonstrated.

Now, with the correct understanding of Subramanian's disclosure the examiner must demonstrate (1) that Subramanian's "[stable oxide that will react with $(A,B)_xO_y]_zO_w$," where x, y, z, and w are indefinite and (2) that the "stable oxide that will react with $(A,B)_xO_y$" can be an oxide of cerium, disclose or teach the claim limitation "cerium oxide with cerium in the +4 oxidation state." In light of the indefiniteness and complexity of the oxide of Subramanian, Applicant respectfully submits that such a teaching cannot be established. Certainly it has not been shown so far.

Showing that there is a cerium oxide that is stable but will react with $(A,B)_xO_y$, where A and B can be any of a wide range of elements and x and y are indefinite, is not possible from the disclosure of Subramanian. But, even if it were chosen, it would still be necessary to demonstrate that "[stable oxide that will react with $(A,B)_xO_y]_zO_w$,", where x, y, z, and w are indefinite, and the "stable oxide that will react with $(A,B)_xO_y$" can be an oxide of cerium, is a disclosure or teaching of the claim limitation "cerium oxide with cerium in the +4 oxidation state."

It might be argued that the burden that the correct interpretation of Subramanian places upon the attempted reconstruction of the present invention is overly high. But that is the problem in relying on prior art that is of an excessively broad, generalized, indefinite form. The examiner has argued that z and w can be any value, because Subramanian is indefinite and no values of z and w are expressed in Subramanian. Thus, the rejections must be tested in light of the excessively vague disclosure of Subramanian.

The initial burden is on the PTO to establish a prima face sec. 102 or sec. 103 rejection based upon a correct factual interpretation of the prior art. Given that the factual

interpretation of the prior art has been flawed in every one of the rejections and their explanations, and that the correct factual issues have not even been discussed by the examiner, Applicant submits that this burden has not been, and cannot possibly have been, met.

Applicant will discuss the seven grounds of rejection in light of the correct interpretation of Subramanian. Grounds 1-3 are those made during prosecution and addressed in the Appeal Brief, and Grounds 4-7 are new. Because every one of the rejections is founded upon Subramanian, the discussion of the Fundamental Flaw is incorporated into each of the following discussions.

Ground 1. Claims 13-17 are rejected under 35 USC 102 over Subramanian U.S. Patent 6,296,945.

A key limitation of claim 13 that is not disclosed in Subramanian is "the sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state." Applicant incorporates the prior discussion of the Fundamental Flaw as to the interpretation of Subramanian. There has been no showing that Subramanian's "[stable oxide that will react with $(A,B)_xO_y]_zO_w$," where A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian, is sufficient to anticipate the limitation of claim 13 that "the sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state."

Subramanian does not disclose cerium in the +4 oxidation state. If Subramanian had such a disclosure, reliance on a secondary reference would not be necessary, as in the new Ground 4 and Ground 5 rejections.

The discussion of this rejection at pages 4-5 of the Examiner's Answer continues to rely on the position that "as z and w are not defined, it indicates that all possible stable oxides can be used..." The thrust of the examiner's position is that indefiniteness is to be interpreted as disclosure in the level of detail required by MPEP 2131 for a sec. 102 rejection: "The identical invention must be shown in as complete detail as is contained in the ... claim." Applicant continues to disagree.

As presented in detail in the "Summary of claimed subject matter" in the Appeal Brief, the present Specification discusses the reason for this limitation at para. [0012], which points out the reason why cerium oxide with cerium in the +4 oxidation state provides particularly improved results over other values of the oxidation state of cerium.

In others of the rejections and discussions, both previously and in the present Examiner's Answer, the examiner admits that Subramanian does not have the required disclosure. The discussion of the next rejection, Ground 2, at page 8, lines 1-3 of the Examiner's Answer, admits: "Subramanian teaches all of the features of these claims except...cerium oxide in a +4 oxidation state...," which is why a secondary reference is invoked. The discussion of the rejection under Ground 5 admits at page 13, lines 7-9 of the Examiner's Answer "Subramanian can be considered as teaching all of the features of these claims except that the selected stable oxide of cerium is such that a +4 oxidation state of cerium is used." This is essentially the same admission that was made at page 6, lines 5-7 of the Final Office Action: "Subramanian teaches all of the features of these claims except that (1) the application of a non cerium oxide precursor and heating to form cerium oxide in a +4 oxidation state..."

Because claim 13 recites "sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state," the sec. 102 rejection of claims 13-17 cannot be maintained in view of these admissions.

The inconsistent position of the Final Office Action is that Subramanian does not disclose "cerium oxide with cerium in the +4 oxidation state" for the purposes of the sec. 103 rejection, but that it does disclose this same recitation for the purposes of the sec. 102 rejection. The sec. 103 position is correct--Subramanian has no such disclosure.

The examiner's response is that "the Examiner disagrees with appellant's argument" (Examiner's Answer, page 22, line 2), but never explains why it is incorrect. There is an attempt to explain away the prior admissions, but the admission at page 13, lines 7-9 of the current Examiner's Answer is unambiguous:

> "Subramanian can be considered as teaching all of the features of these claims except that the selected stable oxide of cerium is such that a +4 oxidation state of cerium is used."

The Examiner's position that Subramanian, taken alone in a sec. 102 rejection, discloses the present invention is further undermined by the Examiner's own position in the Ground 4 and Ground 5 rejections, where there is an admission in each case that Subramanian does not have the required disclosure, and then an attempt to argue that secondary references somehow lead to a conclusion that Subramanian can be interpreted to have the required disclosure.

Ground 2. Claims 1-7, 9, and 11 are rejected under 35 USC 103 over Subramanian in view of Ueda U.S. Patent 5,697,992.

Applicant incorporates the prior discussion of the Fundamental Flaw as to the interpretation of Subramanian. The addition of the teachings of Ueda does nothing to overcome this fundamental flaw.

Applicant addresses the Examiner's positions.

A. Ueda is nonanalogous art.

The correct concept of analogous art as provided in the law, and applied to the present facts, is whether a person of ordinary skill, in trying to improve upon the thermal barrier coating of Subramanian and not having the present patent application in hand, would look to a reference dealing with improving the performance of abrasive particles, which is the subject matter of Ueda. Thermal barrier coatings are not small particles, as in Ueda. Thermal barrier coatings are not made to be abrasive, as in Ueda. Thermal barrier coatings are not used to polish surfaces, which is Ueda's application of the abrasives. Thermal barrier coatings are applied as a layer to protect an underlying substrate.

The examiner attempts to define a different problem that the problem that Subramanian and the present deal with. The examiner asserts that "Here, the problem would be how to apply the initial layer of cerium oxide to the thermal barrier coating..." (Examiner's Answer, page 28, lines 18-19). This is not a correct statement of the problem that Subramanian and the present inventors were addressing. Neither Subramanian nor the present inventors ever state that their problem was how to apply cerium oxide to a surface. Both Subramanian and the present inventors deal with a problem in improving thermal barrier coatings, not in depositing cerium oxide. See the Background portions of Subramanian and the present application.

As far as the examiner's attempted statement of a different "problem" in an attempt to justify the use of Ueda, there is no problem in Subramanian of the type the Examiner argues. Subramanian explains exactly how to perform the application of cerium-containing oxide in his approach, see col. 4 lines 65-66 of Subramanian: use "chemical vapor deposition or a sol-gel technique." These approaches taught by Subramanian do not involve the change in oxidation state recited by the present claims, and the examiner therefore rejects Subramanian's approach in favor of one that, in hindsight, is argued to produce the results needed to maintain the rejection. In any event, the Examiner's Answer does not explain why a person of ordinary skill would abandon the approach expressly

taught by Subramanian to practice his process, in favor of an approach from an unrelated field.

B. The different use of "precursor" in Subramanian and the present approach.

There is no argument presented by the examiner to show that Subramanian uses "precursor" in the same way as do the rejected claims, and in fact it does not as explained in the Appeal Brief. Consequently, Subramanian does not teach the present approach. In the present application, the term "precursor" refers to a compound that is not cerium oxide with cerium in the +4 oxidation state, but which reacts to form cerium oxide with cerium in the +4 oxidation state. In Subramanian, "precursor" refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product. Subramanian deals with different subject matter than the present claims. For a more complete discussion, see the Appeal Brief.

C. Ueda and inherency.

The new inherency theory is argued to be proper because Ueda does the same thing as recited in the present claims. The Examiner's Answer, page 30, lines 6-14 states: "duplicate results would be expected from following duplicate processes." That argument is, of course not correct, because if Ueda used a process that was a duplicate of that of Applicant, the appropriate rejection would be a sec. 102 rejection over Ueda.

Ueda teaches forming a mixture of particles of aluminum oxide or silicon oxide or a precursor, and a cerium oxide precursor, and then calcining. The resulting particles are incredibly fine particles 2 micrometers in size or less (i.e., less than 1/10 of 1/1000 of an inch in size) and then dried. Applicant did not follow any such process. Applicant teaches depositing a bond coat and a thermal barrier coating on an article such as a turbine component. To suggest that these are the "same process" is contrary to the facts. When fine particles are prepared and treated, microchemical and microphysical effects that have no relation to conventional articles may play an important role. What is important is that Ueda never suggests that its process results in "cerium oxide with cerium in the +4 oxidation state."

Referring to the recited limitations of claim 1, Ueda does not deposit a bond coat, and Ueda does not deposit a primary thermal barrier coating. Ueda does not teach a nickel-base superalloy article as recited in claim 2. Ueda does not teach a component of an aircraft gas turbine as recited in claim 3. Ueda does not deposit a bond coat as recited in claim 4. Ueda does not teach with yttria-stabilized zirconia as recited in claim 5. Ueda does not teach infiltration as in claim 7. Ueda does not teach a nickel-base superalloy, depositing a bond coat, and infiltrating as recited in claim 9.

D. The hindsight reconstruction. The Examiner's Answer argues (paragraph bridging pages 30-31) that hindsight reconstruction is proper, relying on In re McLaughlin: "...any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See In re McLaughlin, 443 F2d 1392, 170 USPQ 209 (CCPA 1971)." Applicant traverses this position, both because (1) the rejection was based entirely or partially upon knowledge gleaned from the present Applicant's disclosure, and because (2) it is legally improper.

(1) The present rejections are based entirely or partially upon information gained from Applicant's disclosure. The rejections have sought to argue that Subramanian discloses and teaches "cerium oxide with cerium in the +4 oxidation state", when in fact no mention is made of this limitation in Subramanian. The examiner focused on this language solely because it is found in the present disclosure and claims. Nothing in Subramanian points toward this limitation. Similarly, the examiner focused on Ueda and its $(NH_4)Ce(SO_4)_3$ because it is in some of the present claims and argues that Ueda's process should be substituted for Subramanian's process, even though Subramanian already describes a process for accomplishing its deposition (col. 4, lines 65-66). The examiner disregards Ueda's teaching that it is making abrasive particles, not thermal barrier coatings, because that is what is recited in the present claims.

(2) It is well established that hindsight reconstruction is not an acceptable basis for rejecting a patent claim. In re Fine 5 USPQ2d 1596, 1600 (Fed.Cir. 1988) has made it clear that hindsight reconstruction is not proper:

> "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Further on this point, the Federal Circuit in W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303 (Fed. Cir., 1983) has emphasized that

> "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." 220 USPQ 303, 312-313.

In In re Mercer, 185 USPQ 774, 778 (CCPA 1975), the CCPA stated:

> "The Board's approach amounts in substance, to nothing more than a hindsight 'reconstruction' of the claimed invention by relying on isolated teachings of the prior art without considering the over-all context within which those teachings are presented. Without the benefit of appellant's disclosure, a person having ordinary skill in the art would not know what portions of the disclosure of the reference to consider and what portions to disregard as irrelevant, or misleading. See In re Wesslau, 53 CCPA 746, 353 F.2d 238, 147 USPQ 391 (1965)."

In re McLaughlin is cited by the examiner as support for the proposition that hindsight reconstruction is proper. In re McLaughlin does not stand for any such position. Those seeking support for rejecting patent applications could argue that the quoted language means that no motivation to combine teachings need be found in the prior art, and those seeking to gain allowance would argue to the contrary, but the Federal Circuit has clearly stated otherwise. As stated in In re Fine, 5 USPQ2d 1596, 1599 (Fed.Cir. 1988):

> "Obviousness is tested by 'what the combined teachings of the references would have suggested to those of ordinary skill in the art.' In re Keller, 208 USPQ 871, 881 (CCPA 1981). But it 'cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. ACS Hosp. Sys. [cite omitted]. And 'teachings of references can be combined only if there is some suggestion or incentive to do so.' Id. Here, the prior art contains none. "[emphasis in original]"

The language quoted by the Federal Circuit, 'what the combined teachings of the references would have suggested to those of ordinary skill in the art,' is substantially that relied on in forming the rejection from In re McLaughlin, except taken from a 1981 decision that sets forth the same principles, In re Keller.

The Federal Circuit then goes on to explain that "teachings of references can be combined only if there is some suggestion or incentive to do so. Here, the prior art contains none." [First emphasis in original, second emphasis added.] The Federal Circuit has thus

held that the prior art itself must contain some suggestion or incentive to combine the teachings of the references, by way of clarifying the interpretation of cases like In re McLaughlin.

The examiner has not set forth any asserted objective basis in the prior art references for combining their teachings, because of course there is none. There is no earthly reason for combining the teachings of Subramanian dealing with thermal barrier coatings and Ueda dealing with abrasive particles.

E. The references do not teach the limitations of the claims. The argument that Subramanian teaches cerium oxide in the +4 oxidation state does not identify any location in Subramanian with such a teaching. The argument is essentially that the law of sec. 103 rejections may be ignored. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. There is certainly no suggestion of cerium oxide in the +4 oxidation state in the prior art." See the discussion of the Fundamental Flaw.

Ground 3. Claim 10 is rejected under 35 USC 103 over Subramanian in view of Ueda, and further in view of Taylor U.S. Patent 5,520516.

Applicant incorporates the prior discussion of the Fundamental Flaw as to the interpretation of Subramanian.

As noted in the Appeal Brief and above, no objective basis is presented for combining the teachings of references that deal with thermal barrier coatings and a reference that deals with an abrasive, and which has the completely disparate teachings of Ueda as discussed above in relation to Ground 2.

There is no substantive response in the Examiner's Answer.

Applicant now turns to the four new grounds of rejection.

Ground 4. Claims 13-17 are rejected under 35 USC 102(b) as being anticipated by Subramanian U.S. Patent 6,296,945 in view of Stoffer U.S. Patent 5,932,083. Applicant traverses this ground of rejection.

Claims 13-17

Applicant incorporates the discussion of the Fundamental Flaw as to the interpretation of Subramanian.

Claim 13 recites in part:

> "a sintering-inhibitor region at a surface of the primary ceramic coating, wherein the sintering-inhibitor region comprises cerium oxide <u>with cerium in the +4 oxidation state</u> in a concentration greater than a general cerium oxide concentration in the primary ceramic coating." [emphasis added]

Subramanian has no such disclosure. Subramanian does not disclose cerium in the +4 oxidation state. If Subramanian had such a disclosure, reliance on a secondary reference would not be necessary.

The present claims all recite a highly specific material,

> "cerium oxide with cerium in the +4 oxidation state."

Subramanian discloses:

> "These and other objects of the invention are accomplished by providing a turbine component comprising a metal alloy substrate and a columnar thermal barrier coating on the substrate surface the coating having (1) a columnar-grained ceramic oxide structure material base, and (b) a heat resistant ceramic oxide sheath material covering the columns of the base, where the sheath comprises the reaction product of a ceramic oxide precursor sheath material which consists essentially of the composition C_zO_w and the ceramic oxide columnar structure material which consists essentially of the composition $(A,B)_xO_y$, where A and B are selected from stable oxides which will react with C_zO_w, and <u>C is selected from stable oxides that will react with $(A,B)_xO_y$</u>. A, B, and C can be, for example, at least one of Al_2O_3, CaO, Y_2O_3, Sc_2O_3, ZrO_2, MgO, and the like." [emphasis added] (Subramanian, col. 2, lines 25-40; see also claim 1).

The present rejection is built on the argument that C may be Ce, see for example, Examiner's Answer last two lines of page 10 - page 11, line 6. Component C cannot possibly be Ce, and Subramanian's C_zO_w cannot possibly be Ce_zO_w. According to the

disclosure of Subramanian, "C is selected from stable oxides that will react with $(A,B)_xO_y$", where x and y are indefinite. That is, C itself must be an oxide, and then that oxide C is further combined with oxygen in some unspecified manner and ratio to form a more-complex oxide of the form C_zO_w, where z and w are indefinite. Subramanian's C_zO_w material therefore has a chemical form

> "[stable oxide that will react with $(A,B)_xO_y]_zO_w$"

where A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian.

Stoffer is applied in an effort to prove that Subramanian is inherently teaching that the C_zO_w composition is CeO_2, with Ce in the +4 oxidation state.

At col. 2, lines 50-54, Stoffer states:

> "Cerium possesses highly stable oxides, CeO_2 or Ce_2O_3, in the oxidation states of 3 and 4."

The explanation of the rejection argues that this disclosure of Stoffer necessarily means that Subramanian's C_zO_w composition is CeO_2, with Ce in the +4 oxidation state, or, correctly stated, that Subramanian's "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" is CeO_2, with Ce in the +4 oxidation state.

This argument falls short in at least four ways.

(1) Stoffer does not state that these are the only stable oxides of cerium. Stoffer happens to be interested in CeO_2 or Ce_2O_3 for electrodeposition applications. There is no suggestion that other stable oxides are not present in other circumstances. Nor has the examiner demonstrated that there are no other stable oxides of cerium.

(2) Stoffer is addressing a specific situation, electrodeposited coatings on a metallic surface. There is no disclosure or showing that characteristics of cerium oxide associated with electrodeposited coatings on metal substrates have any relationship to characteristics of cerium oxide associated with vapor-infiltrated or liquid-infiltrated coatings on ceramics, as in Subramanian. See col. 4, lines 64-66 and col. 5, lines 50-67 of Subramanian.

(3) Although the explanation of the rejection relies on the word "stable" in Subramanian, that is not a complete statement of Subramanian's disclosure. As seen in the above quote from Subramanian, Subramanian discloses that "C is selected from stable

oxides that will react with $(A,B)_xO_y$", where C is the C of C_zO_w with z and w undefined. Thus, Subramanian's material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$."

The explanation of the rejection has not demonstrated that the cerium oxides mentioned by Stoffer, CeO_2 or Ce_2O_3, have such a chemical formulation as required by Subramanian, or that a component of them is a "stable oxide that will react with $(A,B)_xO_y$" as disclosed by Subramanian. In fact, the explanation of the rejection does not address this subject at all.

(4) Most remarkably, Stoffer conclusively proves Applicant's position, because Stoffer proves that Subramanian is not necessarily disclosing "cerium oxide with cerium in the +4 oxidation state."

MPEP 2112-2113 sets forth the law on inherency. Inherency is not properly asserted unless there is good evidence to suggest that the asserted property or characteristic is necessarily present in the teachings of the prior art reference. The concept of inherency is not provided as a way to fill in the gaps in missing disclosure or teachings based upon speculation, unless the asserted property or characteristic may be shown to be necessarily present by objective evidence. Instead, "inherency" is used when every aspect of the disclosure of a reference and the claimed subject matter are otherwise exactly the same, then it may be inferred that some property or characteristic further recited in the claim must necessarily be present in the art reference.

MPEP 2112 provides

> "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993); In re Oelrich, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted) "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly

inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)."

To defeat the inherency argument, Applicant need only show that the missing descriptive matter is not "necessarily present in the thing described in the reference." Stoffer makes it clear that there are at least two stable oxides of cerium, with one in the +3 and one in the +4 oxidation state. If we accept the premise of the explanation of the rejection as to Subramanian's disclosure, then Subramanian may be contemplating that the cerium is in the +3 oxidation state referenced by Stoffer. Certainly it is not the case that Subramanian is necessarily disclosing that the cerium of its cerium-containing composition is in the +4 oxidation state.

To summarize, the law and the MPEP place a high bar on an attempt to declare an invention unpatentable under an inherency theory. The explanation of the rejection seeks to make an argument that such a disclosure or teaching is inherently present by relying on some other source. In this case, the relied-upon Stoffer reference proves that a stable cerium oxide is not necessarily in the +4 oxidation state.

Ground 5. Claims 13-17 are rejected under 35 USC 103 as being unpatentable over Subramanian U.S. Patent 6,296,945 in view of Stoffer U.S. Patent 5,932,083. Applicant traverses this ground of rejection.

Claims 13-17

Applicant incorporates the discussion of the Fundamental Flaw.
Claim 13 recites in part:

"a sintering-inhibitor region at a surface of the primary ceramic coating, wherein the sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state in a concentration greater than a general cerium oxide concentration in the primary ceramic coating." [emphasis added].

Subramanian has no such teaching. Subramanian does not teach cerium in the +4 oxidation state. If Subramanian had such a teaching, reliance on the secondary reference would not be necessary.

Subramanian teaches:

> "These and other objects of the invention are accomplished by providing a turbine component comprising a metal alloy substrate and a columnar thermal barrier coating on the substrate surface the coating having (1) a columnar-grained ceramic oxide structure material base, and (b) a heat resistant ceramic oxide sheath material covering the columns of the base, where the sheath comprises the reaction product of a ceramic oxide precursor sheath material which consists essentially of the composition C_zO_w and the ceramic oxide columnar structure material which consists essentially of the composition $(A,B)_xO_y$, where A and B are selected from stable oxides which will react with C_zO_w, and <u>C is selected from stable oxides that will react with $(A,B)_xO_y$</u>. A, B, and C can be, for example, at least one of Al_2O_3, CaO, Y_2O_3, Sc_2O_3, ZrO_2, MgO, and the like." [emphasis added] (Subramanian, col. 2, lines 25-40; see also claim 1).

The present rejection is built on the argument that C may be Ce; see for example, Examiner's Answer, last two lines on page 10-page 11, line 6. Component C cannot possibly be Ce, and Subramanian's C_zO_w cannot possibly be Ce_zO_w as argued at page 10, line 16. According to the disclosure of Subramanian, "C is selected from stable oxides that will react with $(A,B)_xO_y$", where x and y are indefinite. That is, C itself must be an oxide, and then that oxide C is further combined with oxygen in some unspecified manner and ratio to form a more-complex oxide of the form C_zO_w, where z and w are indefinite. Subramanian's C_zO_w material has a chemical form

> "[stable oxide that will react with $(A,B)_xO_y]_zO_w$"

where A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian.

Stoffer is applied in an effort to find a teaching that the C_zO_w composition is CeO_2, with Ce in the +4 oxidation state.

Stoffer is not properly applied as prior art in rejecting the present claims for a number of reasons.

First, MPEP 2143.01 provides that, in constructing a sec. 103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2142 and 2143.02 require that, in combining the teachings of two references, there must be a reasonable expectation of success in the combination. Both of these mandates would be violated in the proposed approach of combining the teachings of Subramanian and Stoffer.

Subramanian teaches deposition of "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" on a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), while Stoffer teaches depositing on a metal substrate by electrodeposition (Title; Abstract; col. 2, line 61; claim 1 at col. 6, lines 2-14). Electrodeposition on metals and electrodeposition on ceramics are fundamentally different, because electrodeposition requires that the substrate be electrically conductive to complete the current path. Electrodeposition can be performed on electrically conductive metallic substrates, but not on electrically nonconductive ceramic substrates of the type discussed by Subramanian because the current path cannot be completed through the electrically nonconductive ceramic substrate.

The attempted use of the electrodeposition of Stoffer to deposit a cerium oxide precursor onto a ceramic material as in Subramanian would be unsuccessful, because electrodeposition cannot deposit onto an electrically nonconductive ceramic material. Subramanian's approach would definitely be rendered unsatisfactory, because it wouldn't work.

Second, at col. 2, lines 50-54, Stoffer teaches cerium in a +3 oxidation state. It is a well-established principle of law that a prima facie case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

> "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)...As "a useful general rule,"..."a reference that 'teaches away' can not create a prima facie case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)."

The reason for this holding is self-evident. If the reference teaches away from the recited approach, there is no basis for reversing that teaching to produce a facsimile of the claimed invention, other than a hindsight reconstruction.

If it were to be argued that Stoffer also teaches cerium in the +4 oxidation state, the question arises how one of ordinary skill knows whether to pick cerium in the +3 or the +4 oxidation state. The answer to that question requires the use of a pure hindsight reconstruction based solely on the claims of the present invention.

There are additional problems in attempting to rely on the teachings of Stoffer.

(1) Stoffer does not teach that these are the only stable oxides of cerium. Stoffer happens to be interested in CeO_2 or Ce_2O_3 for electrodeposition applications. There is no suggestion that other stable oxides are not present in other circumstances. Nor has the examiner demonstrated that there are no other stable oxides of cerium.

(2) Stoffer is addressing a specific situation, electrodeposited coatings on a metallic surface. There is no teaching or showing that characteristics of cerium oxide associated with electrodeposited coatings on metal substrates have any relationship to characteristics of cerium oxide associated with vapor-infiltrated or liquid-infiltrated coatings on ceramic substrates, as in Subramanian. See col. 4, lines 64-66 and col. 5, lines 50-67 of Subramanian.

(3) Although the explanation of the rejection relies on the word "stable" in Subramanian, that is not a complete statement of Subramanian's teaching. As seen in the above quote from Subramanian, Subramanian discloses that "C is selected from stable oxides that will react with $(A,B)_xO_y$", where C is the C of C_zO_w with z and w undefined. Thus, Subramanian's material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$."

The explanation of the rejection has not demonstrated that the cerium oxides mentioned by Stoffer have such a chemical formulation as required by Subramanian, or that a component of them is a "stable oxide that will react with $(A,B)_xO_y$" as disclosed by Subramanian. In fact, the explanation of the rejection does not address this subject at all.

There is no objective basis provided for combining the teachings of Subramanian and Stoffer. Subramanian teaches deposition of "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" on a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), while Stoffer teaches depositing on a metal substrate by electrodeposition (Title; Abstract;

col. 2, line 61; claim 1 at col. 6, lines 2-14). There is no showing that Stoffer can electrodeposit a "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" in any situation. Most significantly, there is no showing as to why a person of ordinary skill would abandon the chemical vapor deposition or sol-gel processes of Subramanian, which are operable for deposition on an electrically nonconductive ceramic, for the electrodeposition of Stoffer, which is not operable for deposition on an electrically nonconductive ceramic.

Ground 6. Claims 1-7, 9 and 11 are rejected under 35 USC 103 as unpatentable over Subramanian in view of Stoffer and Ueda. Applicant traverses this ground of rejection.

Claims 1-7

Applicant incorporates the discussion of the Fundamental Flaw regarding the interpretation of Subramanian.

Claim 1 recites in part:

> "heating the cerium-oxide-precursor compound in an oxygen-containing atmosphere to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating.

Subramanian has no such disclosure. Subramanian does not disclose cerium in the +4 oxidation state. If Subramanian had such a disclosure, reliance on a secondary reference would not be necessary.

Subramanian discloses:

> "These and other objects of the invention are accomplished by providing a turbine component comprising a metal alloy substrate and a columnar thermal barrier coating on the substrate surface the coating having (1) a columnar-grained ceramic oxide structure material base, and (b) a heat resistant ceramic oxide sheath material covering the columns of the base, where the sheath comprises the reaction product of a ceramic oxide precursor sheath material which consists essentially of the composition C_zO_w and the ceramic oxide columnar structure material which consists essentially of the composition $(A,B)_xO_y$, where A and B are selected from stable oxides

which will react with C_zO_w, and C is selected from stable oxides that will react with $(A,B)_xO_y$. A, B, and C can be, for example, at least one of Al_2O_3, CaO, Y_2O_3, Sc_2O_3, ZrO_2, MgO, and the like." [emphasis added] (Subramanian, col. 2, lines 25-40; see also claim 1).

The present rejection is built on the argument that C may be Ce; see for example, Examiner's Answer page 14, line 16. Component C cannot possibly be Ce, and Subramanian's C_zO_w cannot possibly be Ce_zO_w as argued at page 14, line 13. According to the disclosure of Subramanian, "C is selected from stable oxides that will react with $(A,B)_xO_y$", where x and y are indefinite. That is, C itself must be an oxide, and then that oxide C is further combined with oxygen in some unspecified manner and ratio to form a more-complex oxide of the form C_zO_w, where z and w are indefinite. Subramanian's C_zO_w material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$"

where A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian. There has been no showing, or attempt to show, that the "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" has cerium in the +4 oxidation state.

Both of the secondary references are not properly applied as references. Applicant incorporates the prior discussion of both Ueda and Stoffer.

Ueda is nonanalogous art. Stated alternatively, Ueda is not within the scope and content of the prior art that may be used in forming a sec. 103 rejection. Its teachings are therefore not properly combined with the teachings of Subramanian. To be analogous art and properly used in forming a sec. 103 rejection, a reference must be concerned with the same problem as another reference and the claims which are being addressed. See, for example, Medtronic, Inc. v. Cardiac Pacemaker, Inc., 220 USPQ 97, 104 (Fed. Cir. 1983), stating: "Faced with a rate-limiting problem, one of ordinary skill in the art would look to the solutions of others faced with rate-limiting problems."

In the present case, the inventor was concerned with thermal barrier coatings such as those applied to turbine blades and other structures, see the Background section of the Specification. Subramanian was also concerned with thermal barrier coatings, see col. 1, lines 15-22. Ueda deals with abrasive particles, see col. 1, lines 7-11, and has absolutely nothing to do with thermal barrier coatings or similar structures. Ueda never mentions

thermal barrier coatings or anything remotely similar. Ueda is therefore is not properly within the scope of the prior art. A person seeking to improve thermal barrier coatings would have no motivation to extract any abrasive teachings from Ueda and attempt to apply them to the technology of thermal barrier coatings. It is therefore not properly applied in rejecting the present claims.

Stoffer is not properly applied as prior art in rejecting the present claims for a number of reasons.

First, MPEP 2143.01 provides that, in constructing a sec. 103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2142 and 2143.02 require that, in combining the teachings of two references, there must be a reasonable expectation of success in the combination. Both of these mandates would be violated in the proposed approach of combining the teachings of Subramanian and Stoffer.

Subramanian teaches deposition of "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" on a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), while Stoffer teaches depositing on a metal substrate by electrodeposition (Title; Abstract; col. 2, line 61; claim 1 at col. 6, lines 2-14).

The attempted use of the electrodeposition of Stoffer to deposit a cerium oxide precursor onto a ceramic material as in Subramanian would be unsuccessful, because electrodeposition cannot deposit onto an electrically nonconductive ceramic material. Subramanian's approach would definitely be rendered unsatisfactory, because it wouldn't work.

Second, at col. 2, lines 50-54, Stoffer teaches cerium in a +3 oxidation state. It is a well-established principle of law that a prima facie case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

> "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)...As "a useful general rule,"..."a reference that 'teaches away' can not create a prima facie case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)."

The reason for this holding is self-evident. If the reference teaches away from the recited approach, there is no basis for reversing that teaching to produce a facsimile of the claimed invention, other than a pure hindsight reconstruction.

If it were to be argued that Stoffer also teaches cerium in the +4 oxidation state, the question arises how one of ordinary skill knows whether to pick cerium in the +3 or +4 oxidation state. The answer to that question requires the use of a pure hindsight reconstruction based solely on the claims of the present invention.

There are additional problems in attempting to rely on the teachings of Stoffer.

(1) Stoffer does not teach that these are the only stable oxides of cerium. Stoffer happens to be interested in CeO_2 or Ce_2O_3 for electrodeposition applications. There is no suggestion that other stable oxides are not present in other circumstances. Nor has the examiner demonstrated that there are no other stable oxides of cerium.

(2) Stoffer is addressing a specific situation, electrodeposited coatings on a metallic surface. There is no teaching or showing that characteristics of cerium oxide associated with electrodeposited coatings on metal substrates have any relationship to characteristics of cerium oxide associated with vapor-infiltrated or liquid-infiltrated coatings on ceramic substrates, as in Subramanian. See col. 4, lines 64-66 and col. 5, lines 50-67 of Subramanian.

(3) Although the explanation of the rejection relies on the word "stable" in Subramanian, that is not a complete statement of Subramanian's teaching. As seen in the above quote from Subramanian, Subramanian discloses that "C is selected from stable oxides that will react with $(A,B)_xO_y$", where C is the C of C_zO_w with z and w undefined. Thus, Subramanian's material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$."

The explanation of the rejection has not demonstrated that the cerium oxides mentioned by Stoffer have such a chemical formulation as required by Subramanian, or that a component of them is a "stable oxide that will react with $(A,B)_xO_y$" as disclosed by Subramanian. In fact, the explanation of the rejection does not address this subject at all.

There is no objective basis provided for combining the teachings of Subramanian and Stoffer. Subramanian teaches deposition of "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" on a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), while Stoffer teaches depositing on a metal substrate by electrodeposition (Title; Abstract;

col. 2, line 61; claim 1 at col. 6, lines 2-14). There is no showing that Stoffer can even electrodeposit a "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" in any circumstances, much less onto an electrically nonconductive ceramic. Most significantly, there is no showing as to why a person of ordinary skill would abandon the chemical vapor deposition or sol-gel processes of Subramanian, which are operable for deposition on a ceramic, for the electrodeposition of Stoffer, which is not operable for deposition on a ceramic.

But, if Ueda and Stoffer are applied in forming the rejection, the combination of teachings still does not teach the present claim limitations.

The following principle of law applies to all sec. 103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added]. That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the single applied prior art reference clearly does not arguably teach some limitations of the claims.

In the present approach, a cerium-oxide-precursor compound that is not itself cerium oxide with cerium in the +4 oxidation state is deposited on the surface of a primary thermal barrier coating material. The cerium-oxide-precursor compound is thereafter reacted to form cerium oxide with cerium in the +4 oxidation state. The present Specification explains the reasons for this approach and the improved results achieved using this approach, see for example para. [0011]-[0012], and [0029]-[0030].

Subramanian discloses and teaches quite a different approach. Subramanian deposits a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide. Subramanian uses the term "precursor" to mean something very different from its use in the present claims. In the present application, the term "precursor" refers to a compound that reacts to form cerium oxide, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Claim 1 recites in part:

"depositing a cerium-oxide-precursor compound onto an exposed surface of the primary ceramic coating, wherein the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and

heating the cerium-oxide-precursor compound in an oxygen-containing atmosphere to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating." [emphasis added].

Subramanian teaches deposition of a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide that is apparently not "cerium oxide with cerium in the +4 oxidation state." Subramanian uses the term "precursor" to mean something very different from its use in the present claims. In the present application, the term refers to a compound that is not cerium oxide with cerium in the +4 oxidation state, but which reacts to form cerium oxide with cerium in the +4 oxidation state, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Thus, Subramanian has no teaching that the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and that heating in an oxygen-containing atmosphere forms cerium oxide with cerium in the +4 oxidation state.

There is no teaching in Subramanian of producing cerium in the +4 oxidation state. The selection of the +4 oxidation state achieves important advantages as set forth in para. [0012] and [0030] of the present Specification. The selection of the +4 oxidation state is not a matter of design choice, because Subramanian does not present any such design choice. All of Subramanian's discussion is in general terms, without setting forth specific compounds and valence states.

Ueda teaches that a compound, which is not cerium oxide, may be converted to cerium oxide, specifically that ammonium cerium sulfate may be calcined to cerium oxide. That teaching has no relevance at all to the teachings of Subramanian. Subramanian never teaches converting something that is not cerium oxide to cerium oxide, but in fact starts with a cerium-oxygen compound C and reacts it to produce C_zO_w, without ever defining z and w, and then reacts the cerium-oxygen compound with another oxide to get a yet more-complex

oxide reaction product. See for example col. 2, line 57-col. 3, line 25. Consequently, there is no motivation or objective basis for combining the teachings of these references.

Correctly, the explanation of the rejection does not assert that Ueda teaches "cerium oxide with cerium in the +4 oxidation state", and does not assert that Ueda has any relation to "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" taught by Subramanian (Examiner's Answer, page 16, last paragraph on page). The discussion at pages 17-18 of the Examiner's Answer never addresses the relation of Ueda's unspecified type of cerium oxide to the "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" taught by Subramanian.

The explanation of the rejection asserts that Stoffer teaches cerium oxide with cerium in the +3 or +4 oxidation state (page 16, lines 14-15). The explanation of the rejection does not explain why it proposes to adopt only the+4 oxidation state, other than for the hindsight reconstruction of the present invention.

The present rejection seeks to perform a hindsight reconstruction based upon unrelated references, which is technically unsupported and is legally improper.

The case authority and the MPEP provide guidance on this point. The present rejection is a sec. 103 combination rejection. It is well established that a proper sec. 103 combination rejection requires more than just finding teachings in the references of the elements recited in the claim (but which was not done here). To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2143 and 2143.01. See also, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed.Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed.Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicago Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

> "The PTO has the burden under section 103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

> "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

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> "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

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> "A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd.Pat.App. & Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. As discussed above, Subramanian teaches thermal barrier coatings with cerium oxide applied to a ceramic by chemical vapor deposition or sol-gel (col. 4, lines

65-66), Ueda teaches abrasives with the particles and cerium oxide in solution, and Stoffer teaches electrodeposition on metal substrates. A person of ordinary skill would have no reason to attempt to combine these disparate teachings. Additionally, the technical teachings of the references are inconsistent. Ueda teaches that a compound, which is not cerium oxide, may be converted to cerium oxide, specifically that ammonium cerium sulfate may be calcined to cerium oxide. That teaching has no relevance at all to the teachings of Subramanian. Subramanian never teaches converting something that is not cerium oxide to cerium oxide, but in fact starts with a cerium-oxygen compound of the form "[stable oxide that will react with $(A,B)_xO_y]_zO_w$," where A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian, and then reacts the cerium-oxygen compound with another oxide to get a more-complex oxide reaction product. There is just no basis for combining the teachings of these references. Stoffer teaches yet something else, electrodeposition onto a metal substrate.

There has been set forth no objective basis that a person of ordinary skill in the art would seek to combine the widely different teachings of these three references.

Stoffer is also applied in an effort to prove that Subramanian inherently teaches that the C_zO_w composition is CeO_2, with Ce in the +4 oxidation state (Examiner's Answer, page 17, lines 2-3).

At col. 2, lines 50-54, Stoffer states:

> "Cerium possesses highly stable oxides, CeO_2 or Ce_2O_3, in the oxidation states of 3 and 4."

The explanation of the rejection argues that this disclosure of Stoffer necessarily means that Subramanian's C_zO_w composition is CeO_2, with Ce in the +4 oxidation state.

This argument falls short in at least four ways.

(1) Stoffer does not state that these are the only stable oxides of cerium. Stoffer happens to be interested in CeO_2 or Ce_2O_3 for electrodeposition applications. There is no suggestion that other stable oxides are not present in other circumstances. Nor has the examiner demonstrated that there are no other stable oxides of cerium.

(2) Stoffer is addressing a specific situation, electrodeposited coatings on a metallic surface. There is no disclosure or showing that characteristics of cerium oxide associated with electrodeposited coatings on metal substrates have any relationship to characteristics of cerium oxide associated with vapor-infiltrated or liquid-infiltrated coatings

on ceramics, as in Subramanian. See col. 4, lines 64-66 and col. 5, lines 50-67 of Subramanian.

(3) Although the explanation of the rejection relies on the word "stable" in Subramanian, that is not a complete statement of Subramanian's disclosure. As seen in the above quote from Subramanian, Subramanian discloses that "C is selected from stable oxides that will react with $(A,B)_xO_y$", where C is the C of C_zO_w with z and w undefined. Thus, Subramanian's material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$,"

The explanation of the rejection has not demonstrated that the cerium oxides mentioned by Stoffer, CeO_2 or Ce_2O_3, have such a chemical formulation as required by Subramanian, or that a component of them is a "stable oxide that will react with $(A,B)_xO_y$" as disclosed by Subramanian. In fact, the explanation of the rejection does not address this subject at all.

(4) Most remarkably, Stoffer conclusively proves Applicant's position, because Stoffer proves that Subramanian is not necessarily disclosing "cerium oxide with cerium in the +4 oxidation state."

MPEP 2112-2113 sets forth the law on inherency. Inherency is not properly asserted unless there is good evidence to suggest that the asserted property or characteristic is necessarily present in the teachings of the prior art reference. The concept of inherency is not provided as a way to fill in the gaps in missing disclosure or teachings based upon speculation, unless the asserted property or characteristic may be shown to be necessarily present by objective evidence. Instead, "inherency" is used when every aspect of the disclosure of a reference and the claimed subject matter are otherwise exactly the same, then it may be inferred that some property or characteristic further recited in the claim must necessarily be present in the art reference.

MPEP 2112 provides

> "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. <u>In re Rijckaert</u>, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993); <u>In re Oelrich</u>, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or

possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted). "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)."

To defeat the inherency argument, Applicant need only show that the "missing descriptive matter" is not "necessarily present in the thing described in the reference." Stoffer makes it clear that there are at least two stable oxides of cerium, with one in the +3 and one in the +4 oxidation state. If we accept the premise of the explanation of the rejection as to Subramanian's disclosure, then Subramanian may be contemplating that the cerium is in the +3 oxidation state referenced by Stoffer. Certainly it is not the case that Subramanian is necessarily disclosing that the cerium of its cerium-containing composition is in the +4 oxidation state.

To summarize the inherency issue, the law and the MPEP place a high bar on an attempt to declare an invention unpatentable under an inherency theory. In this case, that bar is not met. The rejection seeks to make an argument that such a disclosure or teaching is inherently present by relying on some other source, yet the relied-upon Stoffer reference proves that a stable cerium oxide is not necessarily in the +4 oxidation state.

Claims 9 and 11

Applicant incorporates the discussion of the Fundamental Flaw regarding the interpretation of Subramanian.

The prior discussion of the rejection of claims 1-7 is incorporated here, as some of the legal and factual issues are the same as for claims 9 and 11.

Claim 9 recites in part:

"infiltrating a cerium-oxide-precursor compound from an exposed surface of the primary ceramic coating into the primary ceramic coating,

wherein the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and

heating the cerium-oxide-precursor compound to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating." [emphasis added].

Subramanian has no such disclosure. Subramanian does not disclose cerium that is initially not in the +4 oxidation state, and then is transformed to the +4 oxidation state by heating. If Subramanian had such a disclosure, reliance on secondary references would not be necessary.

Subramanian discloses:

"These and other objects of the invention are accomplished by providing a turbine component comprising a metal alloy substrate and a columnar thermal barrier coating on the substrate surface the coating having (1) a columnar-grained ceramic oxide structure material base, and (b) a heat resistant ceramic oxide sheath material covering the columns of the base, where the sheath comprises the reaction product of a ceramic oxide precursor sheath material which consists essentially of the composition C_zO_w and the ceramic oxide columnar structure material which consists essentially of the composition $(A,B)_xO_y$, where A and B are selected from stable oxides which will react with C_zO_w, and C is selected from stable oxides that will react with $(A,B)_xO_y$. A, B, and C can be, for example, at least one of Al_2O_3, CaO, Y_2O_3, Sc_2O_3, ZrO_2, MgO, and the like." [emphasis added]. (Subramanian, col. 2, lines 25-40; see also claim 1).

The present rejection is built on the argument that C may be Ce, see for example, Examiner's Answer page 14, line 16. Component C cannot possibly be Ce, and Subramanian's C_zO_w cannot possibly be Ce_zO_w as argued at page 14, line 13. According to the disclosure of Subramanian, "C is selected from stable oxides that will react with $(A,B)_xO_y$", where x and y are indefinite. That is, C itself must be an oxide, and then that oxide C is further combined with oxygen in some unspecified manner and ratio to form a more-complex oxide of the form C_zO_w, where z and w are indefinite. Subramanian's C_zO_w material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$"

where A and B are themselves stable oxides that will react with C_zO_w, and x, y, z, and w are indefinite and never defined anywhere in Subramanian. There has been no showing, or attempt to show, that the "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" has cerium in the +4 oxidation state.

Both of the secondary references are not properly applied as references. Applicant incorporates the prior discussion of both Ueda and Stoffer.

Ueda is nonanalogous art. Stated alternatively, Ueda is not within the scope and content of the prior art that may be used in forming a sec. 103 rejection. Its teachings are therefore not properly combined with the teachings of Subramanian. To be analogous art and properly used in forming a sec. 103 rejection, a reference must be concerned with the same problem as another reference and the claims which are being addressed. See, for example, Medtronic, Inc. v. Cardiac Pacemaker, Inc., 220 USPQ 97, 104 (Fed. Cir. 1983), stating: "Faced with a rate-limiting problem, one of ordinary skill in the art would look to the solutions of others faced with rate-limiting problems."

In the present case, the inventor was concerned with thermal barrier coatings such as those applied to turbine blades and other structures, see the Background section of the Specification. Subramanian was also concerned with thermal barrier coatings, see col. 1, lines 15-22. Ueda deals with abrasive particles, see col. 1, lines 7-11, and has absolutely nothing to do with thermal barrier coatings or similar structures. Ueda never mentions thermal barrier coatings or anything remotely similar. Ueda is therefore is not properly within the scope of the prior art. A person seeking to improve thermal barrier coatings would have no motivation to extract any abrasive teachings from Ueda and attempt to apply them to the technology of thermal barrier coatings. It is therefore not properly applied in rejecting the present claims.

Stoffer is not properly applied as prior art in rejecting the present claims for a number of reasons.

First, MPEP 2143.01 provides that, in constructing a sec. 103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2142 and 2143.02 require that, in combining the teachings of two references, there must be a reasonable expectation of success in the combination. Both of these mandates would be violated in the proposed approach of combining the teachings of Subramanian and Stoffer.

Subramanian teaches deposition of "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" on a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), while Stoffer teaches depositing on a metal substrate by electrodeposition (Title; Abstract; col. 2, line 61; claim 1 at col. 6, lines 2-14).

The attempted use of the electrodeposition of Stoffer to deposit a cerium oxide precursor onto a ceramic material as in Subramanian would be unsuccessful, because electrodeposition cannot deposit onto an electrically nonconductive ceramic material. Subramanian's approach would definitely be rendered unsatisfactory, because it wouldn't work.

Second, at col. 2, lines 50-54, Stoffer teaches cerium in a +3 oxidation state. It is a well-established principle of law that a prima facie case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

> "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)...As "a useful general rule,"..."a reference that 'teaches away' can not create a prima facie case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)."

The reason for this holding is self-evident. If the reference teaches away from the recited approach, there is no basis for reversing that teaching to produce a facsimile of the claimed invention, other than a pure hindsight reconstruction.

If it were to be argued that Stoffer also teaches cerium in the +4 oxidation state, the question arises how one of ordinary skill knows whether to pick cerium in the +3 or +4 oxidation state. The answer to that question requires the use of a pure hindsight reconstruction based solely on the claims of the present invention.

There are additional problems in attempting to rely on the teachings of Stoffer.

(1) Stoffer does not teach that these are the only stable oxides of cerium. Stoffer happens to be interested in CeO_2 or Ce_2O_3 for electrodeposition applications. There is no suggestion that other stable oxides are not present in other circumstances. Nor has the examiner demonstrated that there are no other stable oxides of cerium.

(2) Stoffer is addressing a specific situation, electrodeposited coatings on a metallic surface. There is no teaching or showing that characteristics of cerium oxide associated with electrodeposited coatings on metal substrates have any relationship to characteristics of cerium oxide associated with vapor-infiltrated or liquid-infiltrated coatings on ceramic substrates, as in Subramanian. See col. 4, lines 64-66 and col. 5, lines 50-67 of Subramanian.

(3) Although the explanation of the rejection relies on the word "stable" in Subramanian, that is not a complete statement of Subramanian's teaching. As seen in the above quote from Subramanian, Subramanian discloses that "C is selected from stable oxides that will react with $(A,B)_xO_y$," where C is the C of C_zO_w with z and w undefined. Thus, Subramanian's material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$."

The explanation of the rejection has not demonstrated that the cerium oxides mentioned by Stoffer have such a chemical formulation as required by Subramanian, or that a component of them is a "stable oxide that will react with $(A,B)_xO_y$" as disclosed by Subramanian. In fact, the explanation of the rejection does not address this subject at all.

There is no objective basis provided for combining the teachings of Subramanian and Stoffer. Subramanian teaches deposition of "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" on a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), while Stoffer teaches depositing on a metal substrate by electrodeposition (Title; Abstract; col. 2, line 61; claim 1 at col. 6, lines 2-14). There is no showing that Stoffer can even electrodeposit a "[stable oxide that will react with $(A,B)_xO_y]_zO_w$." Most significantly, there is no showing as to why a person of ordinary skill would abandon the chemical vapor deposition or sol-gel processes of Subramanian, which are operable for deposition on a ceramic, for the electrodeposition of Stoffer, which is not operable for deposition on a ceramic (electrodeposition requires deposition on an electrical conductor).

But, if Ueda and Stoffer are applied in forming the rejection, the combination of teachings still does not teach the present claim limitations.

In the present approach, a cerium-oxide-precursor compound that is not itself cerium oxide with cerium in the +4 oxidation state is deposited on the surface of a primary thermal barrier coating material. The cerium-oxide-precursor compound is thereafter reacted to

form cerium oxide with cerium in the +4 oxidation state. The present Specification explains the reasons for this approach and the improved results achieved using this approach, see for example para. [0011]-[0012], and [0029]-[0030].

Subramanian discloses and teaches quite a different approach. Subramanian deposits a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide. Subramanian uses the term "precursor" to mean something very different from its use in the present claims. In the present application, the term "precursor" refers to a compound that reacts to form cerium oxide, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Claim 1 recites in part:

> "depositing a cerium-oxide-precursor compound onto an exposed surface of the primary ceramic coating, <u>wherein the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state</u>, and
>
> heating the cerium-oxide-precursor compound in an oxygen-containing atmosphere to form cerium oxide <u>with cerium in the +4 oxidation state</u> adjacent to the exposed surface of the primary ceramic coating." [emphasis added].

Subramanian teaches deposition of a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide that is apparently not "cerium oxide with cerium in the +4 oxidation state." Subramanian uses the term "precursor" to mean something very different from its use in the present claims. In the present application, the term refers to a compound that is not cerium oxide with cerium in the +4 oxidation state, but which reacts to form cerium oxide with cerium in the +4 oxidation state, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Thus, Subramanian has no teaching that the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and that heating in an oxygen-containing atmosphere forms cerium oxide with cerium in the +4 oxidation state.

There is no teaching in Subramanian of producing cerium in the +4 oxidation state. The selection of the +4 oxidation state achieves important advantages as set forth in para. [0012] and [0030] of the present Specification. The selection of the +4 oxidation state is not a matter of design choice, because Subramanian does not present any such design choice. All of Subramanian's discussion is in general terms, without setting forth specific compounds and valence states.

Ueda teaches that a compound, which is not cerium oxide, may be converted to cerium oxide, specifically that ammonium cerium sulfate may be calcined to cerium oxide. That teaching has no relevance at all to the teachings of Subramanian. Subramanian never teaches converting something that is not cerium oxide to cerium oxide, but in fact starts with a cerium-oxygen compound C and reacts it to produce C_zO_w, without ever defining z and w, and then reacts the cerium-oxygen compound with another oxide to get a yet more-complex oxide reaction product. See for example col. 2, line 57-col. 3, line 25. Consequently, there is no motivation or objective basis for combining the teachings of these references.

Correctly, the explanation of the rejection does not assert that Ueda teaches "cerium oxide with cerium in the +4 oxidation state," and does not assert that Ueda has any relation to "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" taught by Subramanian (Examiner's Answer, page 16, last paragraph on page). The discussion at pages 17-18 of the Examiner's Answer never addresses the relation of Ueda's unspecified type of cerium oxide to the "[stable oxide that will react with $(A,B)_xO_y]_zO_w$" taught by Subramanian.

The explanation of the rejection asserts that Stoffer teaches cerium oxide with cerium in the +3 or +4 oxidation state (page 16, lines 14-15). The explanation of the rejection does not explain why it proposes to adopt only the+4 oxidation state, other than for the hindsight reconstruction of the present invention.

The present rejection seeks to perform a hindsight reconstruction based upon unrelated references, which is technically unsupported and is legally improper. Applicant incorporates the prior discussion of the legal requirements.

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. As discussed above, Subramanian teaches thermal barrier coatings with cerium oxide applied to a ceramic by chemical vapor deposition or sol-gel (col. 4, lines 65-66), Ueda teaches abrasives with the particles and cerium oxide in solution, and Stoffer

teaches electrodeposition on metal substrates. A person of ordinary skill would have no reason to attempt to combine these disparate teachings. Additionally, the technical teachings of the references are inconsistent. Ueda teaches that a compound, which is not cerium oxide, may be converted to cerium oxide, specifically that ammonium cerium sulfate may be calcined to cerium oxide. That teaching has no relevance at all to the teachings of Subramanian. Subramanian never teaches converting something that is not cerium oxide to cerium oxide, but in fact starts with a cerium-oxygen compound of the form C_zO_w, without ever defining z and w, and then reacts the cerium-oxygen compound with another oxide to get a more-complex oxide reaction product. There is just no basis for combining the teachings of these references. Stoffer teaches yet something else, electrodeposition onto a metal substrate.

There has been set forth no objective basis that a person of ordinary skill in the art would seek to combine the widely different teachings of these three references.

Stoffer is also applied in an effort to prove that Subramanian is inherently teaching that the C_zO_w composition is CeO_2, with Ce in the +4 oxidation state (Examiner's Answer, page 17, lines 2-3).

At col. 2, lines 50-54, Stoffer states:

> "Cerium possesses highly stable oxides, CeO_2 or Ce_2O_3, in the oxidation states of 3 and 4."

The explanation of the rejection argues that this disclosure of Stoffer necessarily means that Subramanian's C_zO_w composition is CeO_2, with Ce in the +4 oxidation state.

This argument falls short in at least four ways.

(1) Stoffer does not state that these are the only stable oxides of cerium. Stoffer happens to be interested in CeO_2 or Ce_2O_3 for electrodeposition applications. There is no suggestion that other stable oxides are not present in other circumstances. Nor has the examiner demonstrated that there are no other stable oxides of cerium.

(2) Stoffer is addressing a specific situation, electrodeposited coatings on a metallic surface. There is no disclosure or showing that characteristics of cerium oxide associated with electrodeposited coatings on metal substrates have any relationship to characteristics of cerium oxide associated with vapor-infiltrated or liquid-infiltrated coatings on ceramics, as in Subramanian. See col. 4, lines 64-66 and col. 5, lines 50-67 of Subramanian.

(3) Although the explanation of the rejection relies on the word "stable" in Subramanian, that is not a complete statement of Subramanian's disclosure. As seen in the above quote from Subramanian, Subramanian discloses that "C is selected from stable oxides that will react with $(A,B)_xO_y$," where C is the C of C_zO_w with z and w undefined. Thus, Subramanian's material has a chemical form

"[stable oxide that will react with $(A,B)_xO_y]_zO_w$."

The explanation of the rejection has not demonstrated that the cerium oxides mentioned by Stoffer, CeO_2 or Ce_2O_3, have such a chemical formulation as required by Subramanian, or that a component of them is a "stable oxide that will react with $(A,B)_xO_y$" as disclosed by Subramanian. In fact, the explanation of the rejection does not address this subject at all.

(4) Most remarkably, Stoffer conclusively proves Applicant's position, because Stoffer proves that Subramanian is not necessarily disclosing "cerium oxide with cerium in the +4 oxidation state."

Applicant incorporates the prior discussion of the law on inherency.

To defeat the inherency argument, Applicant need only show that the "missing descriptive matter" is not "necessarily present in the thing described in the reference." Stoffer makes it clear that there are at least two stable oxides of cerium, with one in the +3 and one in the +4 oxidation state. <u>If we accept the premise of the explanation of the rejection as to Subramanian's disclosure, then Subramanian may be contemplating that the cerium is in the +3 oxidation state referenced by Stoffer</u>. Certainly it is not the case that Subramanian is <u>necessarily</u> disclosing that the cerium of its cerium-containing composition is in the +4 oxidation state.

To summarize the inherency issue, the law and the MPEP place a high bar on an attempt to declare an invention unpatentable under an inherency theory. After all, the whole point of the effort to invoke inherency is that the reference does not expressly disclose or teach the critical limitation, and the examiner seeks to convince us that the disclosure is necessarily there even though unwritten. The rejection seeks to make an argument that such a disclosure or teaching is inherently present by relying on some other source. In this case, the relied-upon Stoffer reference proves without a doubt that a stable cerium oxide is not necessarily in the +4 oxidation state.

Ground 7. Claim 10 is rejected under 35 USC 103 as unpatentable over Subramanian in view of Stoffer and Ueda, and further in view of Taylor U.S. Patent 5,520,516. Applicant traverses this ground of rejection.

Claim 10 depends from claim 9, and incorporates its limitations. The combination of Subramanian, Stoffer and Ueda does not teach these limitations for the reasons stated above, and which are incorporated here. Taylor adds nothing in this regard.

There is no objective basis for combining the teachings of Taylor with those of Subramanian, Stoffer, and Ueda.

SUMMARY AND CONCLUSION

The basis of all seven of the grounds of rejection is a misinterpretation of the disclosure of Subramanian, as discussed above.

None of the references discloses, teaches, or suggests forming "cerium oxide with cerium in the +4 oxidation state", a key limitation of all of the claims.

None of the references discloses, teaches, or suggests a "cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state," which is then heated to form "cerium oxide with cerium in the +4 oxidation state", a limitation of claims 9-11.

Thus, neither the recited specific compounds nor the recited processing are disclosed, taught, or suggested by the prior art references, either taken alone or in combination.

Under these circumstances, the prior art cannot disclose or teach the limitations of the pending claims.

Applicant asks that the Board reverse the rejections.

It is believed that no fees are associated with the filing of this Reply Brief. In the event that Applicant is mistaken in its calculations, the Director is authorized to charge any fee determined to be due to Deposit Account 50-1059.

Respectfully submitted,

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Attorney Docket No.: 130013/11921 (21635-0116)
Application No.: 10/735,370
Filed: December 12, 2003